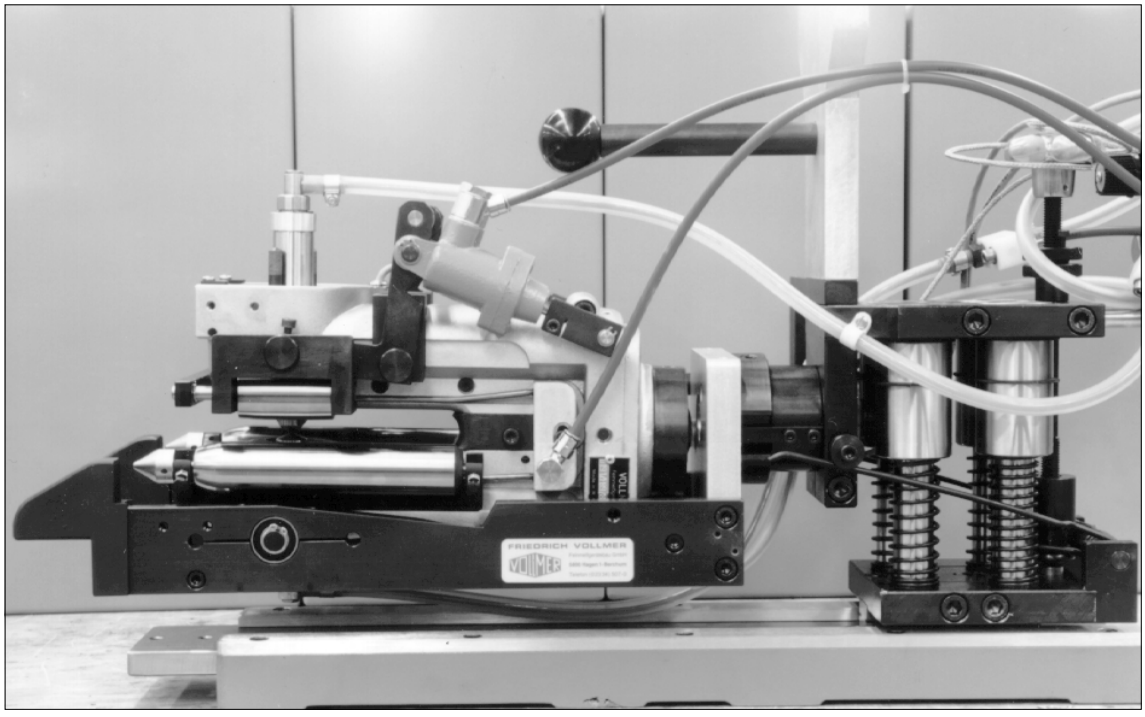
Automatic Thickness Gauge
For
Fast Running Cold Strip



VBM 1063

Operating and Service Manual

Table of Content

Safety Precautions, please read carefully!

This manual has to be handed to the machine operator, and one copy must be permanently available to operator and service personnel.

Nobody is allowed to work on or with the gauge, before he has read and understood this manual. Feel free to call the Vollmer company in case of any questions (phone +49 2334 507 0).

Warning , Crushing Hazard ! In some applications this gauge has a hydraulic traverse unit. It has to be switched to the mode 'Service I', before anybody enters the danger zone. When operating in the standard mode ('Service 0') the gauge might rush back or foreward unexpected and uncontrollable.

Hands or fingers which are put into the vertical guide behind the gauge or into the slidebase below the gauge, might get caught and heavily injured if the gauge head moves up/down or is traversed.

We care about your health.

Please follow the safety precautions.

Especially if you have many years of professional experience, you will be a Good example for younger colleagues

A pneumatic vertical guide and pneumatic operated guide rollers might cause injuries on hands and fingers. In case of a pressure drop, the vertical guide with the gauge head might leap up. Under certain conditions, the guide rollers might close the gap unexpectedly. Therefore the pneumatic system must be de-pressurized before anybody starts to work on this gauge.

The aluminium gauge head might get hot. Therefore check the temperature before trying to handle the gauge head.

If the gauge head is operated automatically or semiautomatically, the documentation contains a description of the control program for this application. Nobody is allowed to work on the gauge unless he knows the control program sequences. For your own safety, please make sure to get familiar with the control program sequences before you start to work on the gauge !

Intended use of this machine

This gauge must be used exclusively for the measurement of cold strip. It must be firmly installed in its intended position and electrically, electronically, hydraulically and pneumatically connected as intended by the Vollmer company. Any alteration might cause severe damage.

Operation mode selector switch 'Service I/0'

If the gauge has an automatic traverse unit, the electronic cabinet contains a selector switch 'Service I/0'.

'Service 0' is the position for the normal operation mode in which the gauge is traversed back and forward automatically. If e.g. if the strip tension breaks down or if the strip moves laterally the gauge head is traversed off the strip into its rear limit position with double speed. Danger: Crushing Hazard! Nobody is allowed in the danger zone as long as the system in the 'Service 0' mode.

'Service I' is the position for service operation. The gauge head can only be traversed by inching service by manual controls in the operator's desk. The automatic traverse controlling is switched off, so that the gauge will not move automatically. Caution: crushing hazard for hands and fingers! Do not put hands or fingers into the vertical guide or the slidebase while the gauge head is moving.

Design and function

The VBM 1063 is designed to measure strip thickness on high quality strip in fast running cold rolling mills. The gauge measures the passing material continuously in its measurement mouth which has a depth of 100 mm.

The strip passes the C-shaped thickness measurement frame with two thickness feelers which are measuring the running strip simultaneously from the top and from the bottom. This can be done by single measurement or by sum measurement:

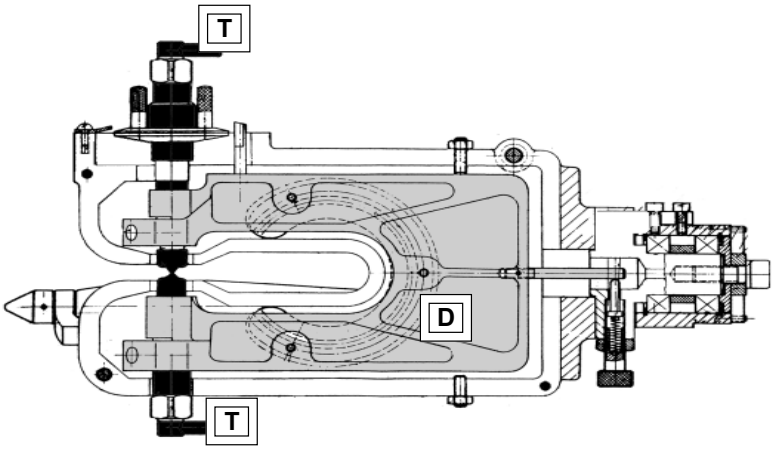
- **Single measurement** means to measure strip thickness between an electronic LVDT transducer and a micrometer fine adjustment feeler. It is designed for slow running strip.

- **Sum measurement** is used to measure fast running strip with high quality surface. Two electronic transducers measure the strip from either side. As only a small amount of mass has to be moved instead of the entire C-frame, the two transducer tips are able to follow the surface even in case of vibrating strip.

Both measurement methods provide results of high accuracy, but they require different ways of gauge adjustment.

Due to strip thickness changes, the transducer tips are pushed apart or come closer. The transducer tips are crowned and polished diamonds, which do not leave any marks on the strip.

At its rear end each transducer has got a differential transformer. The movable core of this transformer is connected to the measurement tip which is sliding on the strip surface. In this way any movement of the measurement tip is measured inductively.



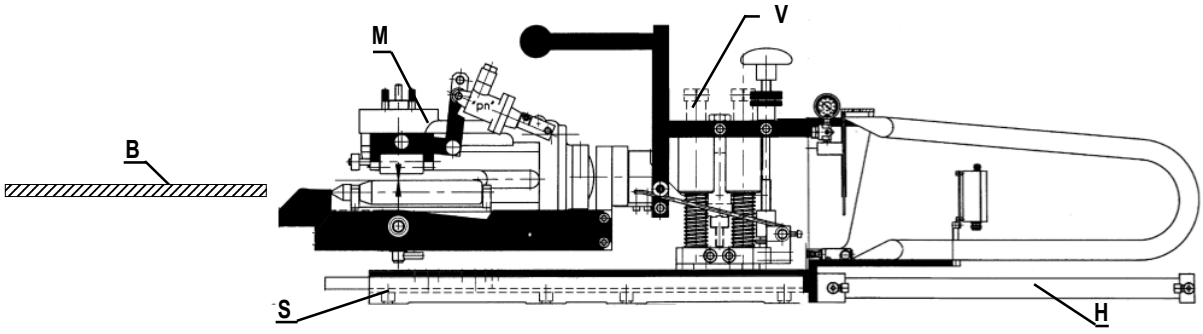
VBM 1063: The two thickness measurement transducers (T) are measuring in sum. The measurement frame D is installed in two C-shaped ball bearings.

All changes within both transducers are passed to a VMF measurement amplifier, where they are added (sum measurement). The amplifier indicates a measurement result as deviation from zero, i.e. the difference to the preset nominal size.

Depending on the type of the gauge, there are several ways for electronic or mechanical nominal size setting, so that the measurement amplifier indicates 0 when the measured strip thickness matches the nominal thickness.

The C-shaped measurement frame in the gauge has an extremely low temperature extension. It is held in two C-shaped ball bearings. The gauge head is held in the passline by a spring suspended vertical guide. Guide rollers hold it always parallel to the strip surface.

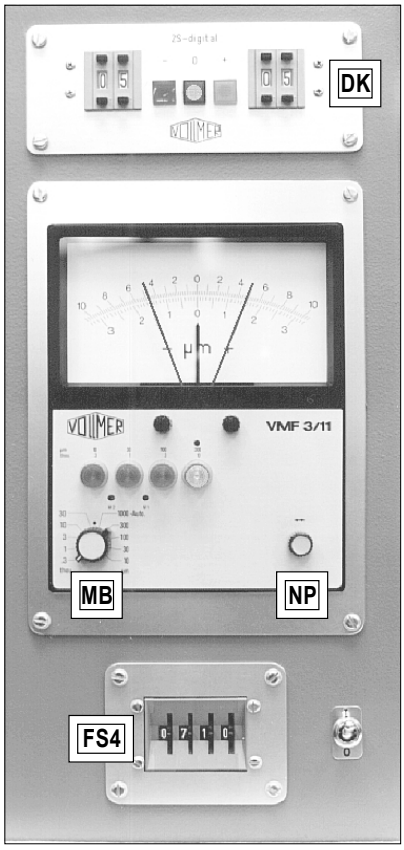
Amplifier measurement data can be used as signal for controlling and for quality monitoring documentation according to ISO 9000. It is available on two analog voltage outputs. Some VMF amplifiers do additionally provide digital data outputs.



Side view on a VBM 1063: The Gauge head M is suspended by vertical guide V. The vertical guide is traversed in the slidebase S by the hydraulic cylinder H between the rear limit position (shown here) and the measurement position on strip B.

System

The VBM 1063 gauge is always installed with a VMF measurement amplifier. This measurement amplifier indicates the difference between measured strip thickness and selected nominal size. A separate instruction of the measurement amplifier is part of the documentation.

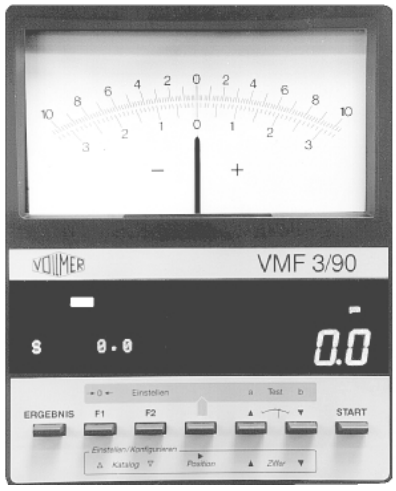


Measurement amplifier VMF 311 with electronic classifier 2S (top) and nominal size selector FS4 (bottom).

The measurement amplifier continuously indicates the difference between nominal and actual strip thickness. The operator can select the resolution of the analogue indicator by the measurement range selector MB. Full deflection can indicate from 1000 microns (.030") down to 10 microns (.0003"). The zero potentiometer NP allows to eliminate small deviations of the gauge zero.

Tolerance limits can be set by the two-digit switches DK of the electronic classifier. Coloured control lamps indicate whether the measurement value is in, over or below tolerance. Such classifiers are optional equipment, their operation is described in a separate manual.

The (optional) nominal size selector FS4 shows the selected nominal size in microns (or steps of 0.0001", depending on the FS4 type).



The amplifier VMF 3/2000 includes all components described above. It puts out the measurement data with statistic evaluation ready for quality control documentation according to ISO 9000. Its internal automatic adjustment provides the best possible measurement accuracy at any time.

The VMF 3/2000 amplifier is capable of processing transducer signals of overall 4 mm measurement stroke (instead of 2 mm like the VMF 3/11 and 3/22 types). Transducers of the ../90 series and the VMF 3/90 amplifier can be used to upgrade nearly all Vollmer gauges.

Nominal size setting

If the required material thickness - e.g. 500 µm - is entered as nominal size and if the measurement is 501 µm, the amplifier will indicate + 1 µm.

So it is possible to stay within the highest sensitivity range of the indicator no matter of the material thickness. In this range the full deflection of the indicator covers a range of +/-10 microns.

Nominal size can be set in several ways:

- **mechanically** (single measurement with micrometer fine adjustment): The fine adjustment is set to the selected nominal size on its micrometer thread. The size is indicated by a digital turns counter.

- **mechanically** (sum measurement adjustable transducer): The adjustable transducer is set to the selected nominal size on its micrometer thread. Depending on the model, the nominal size is indicated by a digital turns counter (mod. Di) or a scale (mod. Scale) or via an electronic pulse encoder on a separate digital indicator (mod. ME).

- **electronically** (sum measurement with two transducers and FS 3/4): there is no mechanical transducer adjustment, but the measurement value is electronically compensated for the nominal value by the setting of a thumb wheel switch, so that the selected nominal size is indicated as zero.

The electronic adjustment is limited to 1,5 or 3 mm, depending on the transducer type. It can be combined with an adjustable transducer (mod. Di, Scale or ME) i.e. the upper transducer is mechanically adjusted to one nominal size, and from that position it can be adjusted electronically to different nominal sizes.

Depending on the application there are additional control, indicator or data processing devices which can be connected to the measurement electronics.

Types

According to individual requirements of our customers, Vollmer gauges are produced in many different types. The gauge card in the documentation shows the type of your gauge. The following list is a general overview about the available items:

e.g.: **VBM 1063 E/Su/FS4/pn/ka/T/K/A0/DAV/2S-dig/AS/Hwst500.**

Meaning of the abbreviations:

VBM1063 E:
Electronic strip thickness gauge for high quality strip on fast cold rolling mills, measurement depth up to 100 mm from the strip edge.

Su:
Measurement by 2 transducers in sum; accurate measurement values even in case of strip vibration.

FS3/FS4:
Remote selection of nominal size by a thumb wheel with 3 or 4 decades.

pn:
The upper guide rollers are pneumatically pushed down onto the strip (i.e. the gap between upper and lower guide rollers is closed) when the gauge is in On Strip position (measuring position).

ka:
With this cardan suspension the gauge measures precisely, even when the strip lies in a hollow shape.

T:
Heating elements in the gauge head for keeping a constant temperature, against long-term drift because of heat coming from the strip into the gauge.

K:
Air cooling of the transducer's measurement tips, against short-term drift if the measurement tips are heated by the strip.

A0:
Electronic adjustment system, which works when the gauge is in its rear limit position. The gauge is set to nominal size zero. Then the amplifier adjusts itself to zero. This procedure is started either by pressing a key or by time automatic, available only in combination with VMF 3/22 or VMF 3/2000.

DAV:
The diamond measurement tips of the two transducers are pneumatically pulled apart when the gauge is traversed, in order not to damage them at the strip edge. For measurement of wavy strip or vibrating strip the measurement pressure can be pneumatically increased to prevent the measurement tips from losing contact to the surface.

2S dig:
Digital electronic classifier, decade switches to set upper and lower tolerance limit. "In tolerance" values are indicated by a green control lamp, "below tolerance" is shown in red and "exceeding the upper limit" is indicated by a yellow lamp.

AS:
Automatic symmetry adjustment, the transducer tips can be moved up/down pneumatically instead of manual manipulation

Hwst 500:
hydraulic traverse unit consisting of a control unit and a slidebase, stroke of the hydraulic cylinder is 500 mm

Operation

Depending on the application the gauge operates manually or automatically controlled.

During manual operation the most important thing is, to move the gauge off the strip before the strip end runs through it.

If - in automatic mode - the gauge is switched to „on strip“, it moves automatically into the measurement position. If it is ready to measure, the measurement electronic puts out a start signal.

Mostly the measurement position is detected by a light barrier aside the measurement head. As soon as the light beam is interrupted when the gauge head crosses the strip edge, a timer starts which stops the movement after a preselected time (set during commissioning). Instead of the timer it is also possible to use a pulse encoder for the controlling of the measurement depth. In that case the measurement depth can be set by a decade switch and the selected measurement depth is digitally indicated.

“Off strip“ makes the gauge moving back to its rear position immediately, independent of the actual position.

Before the strip end passes through and would damage the gauge, an external signal is given and the gauge automatically moves off the strip. Various electronic interlocks are possible to avoid damage. For example a strip tension breakdown may be the trigger for retracting the gauge. Or the gauge moves only on strip and remains there, if a certain rolling speed is exceeded. Each gauge is provided with a safety switch. If the strip reaches too far into the measurement mouth, the gauge is retracted.

While the gauge moves forward or backwards, the DAV (Diamond Lifting Device) operates automatically. The transducers are lifted in order to avoid the diamonds scratching over the strip edge or click together when the gauge moves back. The process is specified in the records of PLC (if the gauge has an automatic traversing device).

In the "Service I" mode the gauge head can be hydraulically moved back and forward by inching operation. In this mode the compressed air supply is switched off, i.e. the pneumatic guide rollers cannot be closed and the DAV is not operational.

When pressing the A0 button (for an automatically traversed gauge), the gauge is treversed to its rear limit position and is automatically set to zero. After the amplifier has adjusted itself to zero the gauge is traversed On Strip again.

Measurement

Zero check

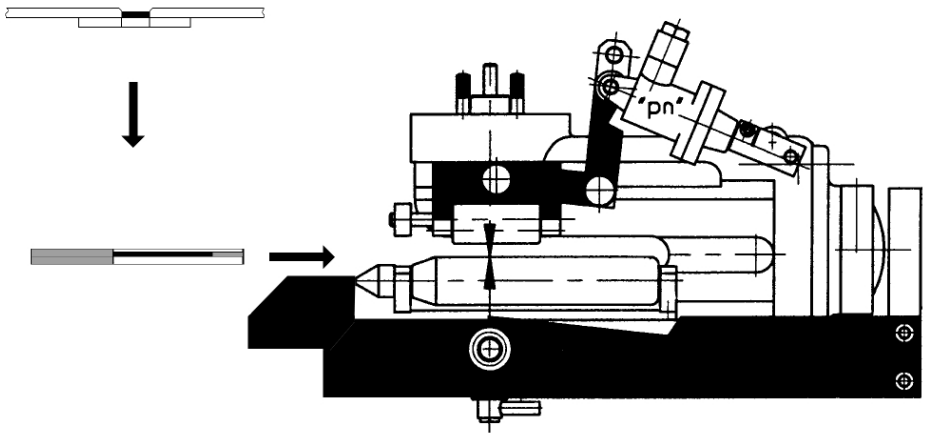
Zero checking should be performed regularly. Set the gauge to nominal size zero and check the VMF indication. It should be zero. Minor deviations can be eliminated by the VMF 3/22 zero potentiometer or by the Master key of the VMF 3/2000.

Then operate the DAV or put a thin piece of material between the transducer tips and take it out again. The indication must return to zero. If not, check the gauge (see section "Trouble shooting").

Indication check

If the previous test shows a constant zero, check the gauge measurement by means of an adjustment plate with integrated slip gauge (optional addition). This test should be made regularly, especially when rolling with tight tolerances. The gauge must be in its rear limit position and in the "Service I' position.

At first set the nominal size to the thickness of the slip gauge and turn off the working pressure of the pneumatic guide rollers. Then insert the slip gauge plate between the guide rollers as shown in the sketch. When the transducer tips measure the integrated slip gauge, then the indication should be very close to zero (+/- 0,5 µm). If not check the entire gauge adjustment.



To check the gauge with an adjustment plate: The thick part in the center of the plate is pointing downwards. Please follow the safety precautions and set the gauge into the 'Service I' mode, before somebody is allowed to go into the danger zone.

Nominal size and tolerance limits

After the zero check, nominal strip thickness is set mechanically (by fine adjustment/micrometer) and/or electronically by the FS4 thumb wheel switch.

The tolerance limits can be entered into the electronic classifier 2S or 4S (optional item, see separate instructions) or by then keys of the VMF 3/ 2000.

Measurement start and end

For measurement the gauge is forwarded to the "on strip" position. If it has a DAV, the transducer tips are then lifted automatically until the gauge is in measurement position.

Measurement amplifier and classifier now indicate the difference between nominal and actual size and whether the measurement value is in or below tolerance, or if it is exceeding the upper limit.

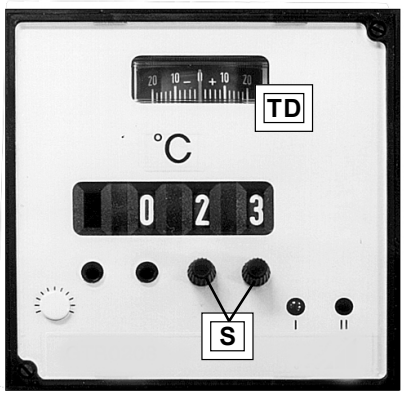
Important note for manually traversed gauges

Please do always move the gauge off the strip before the strip tension is switched off! The strip end must never pass through the gauge, as it will cause serious damage.

Continuous checking

In between the service intervals, it is recommended to check the gauge regularly:

Temperature: After the gauge was traversed into the rear limit position, the temperature must not change. That means, the temperature deviation indicator TD should remain constantly close to zero. If the temperature is not constant, adjust the heater by setting a new gauge temperature with the two knobs S. Ideally the Lamp H (Heater) at the pneumatic cabinet is indicating, that the 'on' and 'off' periods are of about the same duration.

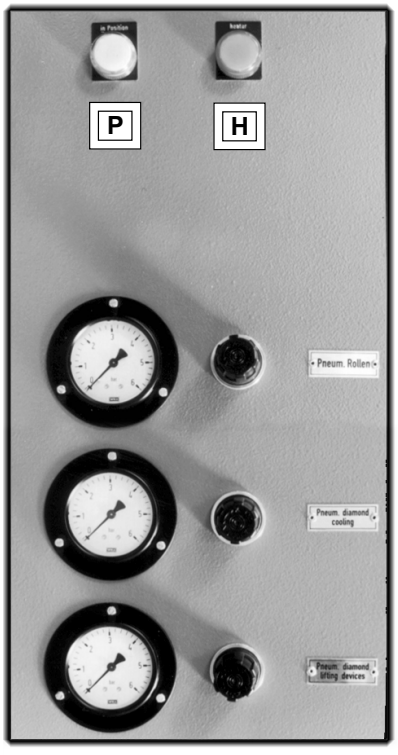


Temperature control device in the electronic cabinet

Compressed air supply: Working pressure for pneumatic guide rollers (optional) is 3 - 5 bar, depending on the strip material, controlled by a magnetic valve that opens if the light barrier is detecting that the gauge is in measurement position (lamp P 'in position' is on).

Transducer lifting device: When the gauge is traversing, the thickness indicator needle must be at the 'minus' limit stop.

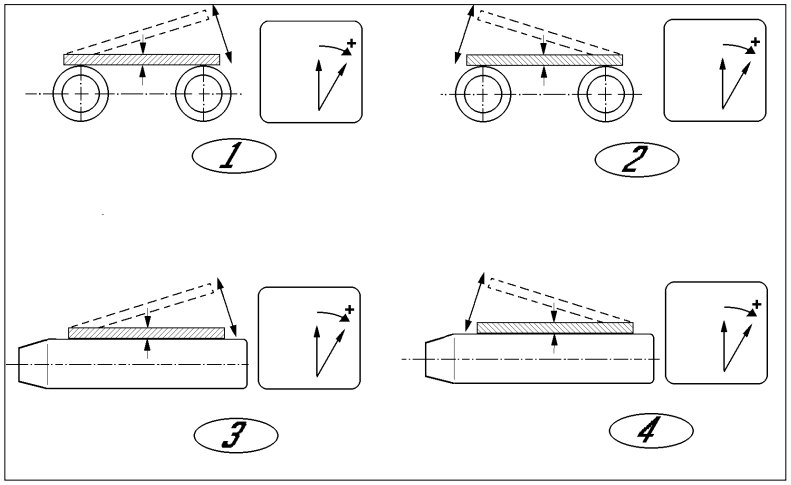
Symmetry check: Switch into the 'Service I' mode, set nominal size to 0, move both transducer tips up and down, (indication has to be 0 µm +/-0,5 µm). In case of tight tolerances check daily, otherwise weekly). Gauges with AS do this procedure automatically. Both ways are described in a separate manual for the VMF amplifier.



Side view of the pneumatic cabinet

Accuracy check with slip gauge: Set the gauge to the nominal size of the slip gauge, and insert the adjustment plate between the transducer tips. The indication should be zero. In case of tight tolerances check daily, otherwise weekly.

Transducer position to the strip: The transducers must stand perpendicular to the strip. Lift or remove the upper guide rollers and put the test plate onto the lower guide rollers. Tip it to both sides as well as to the front and to the back (see sketch 1 through 4). The display may only deflect to the + side. If not, check the whole gauge. This check is recommended after a strip breaking or other hard treatment.



For your convenience, the Vollmer company offers a special adjustment plate with an integrated slip gauge, which is individually selected to match the thickness of that strip which is usually rolled on your mill (see picture under 'Measurement / Indication Check'.

Guide rollers: Check for easy rotation.

Passline: Check the correct height of the gauge to the strip

Safety Precations

Nobody must work on the gauge unless it has been switched into the 'Service I' mode. This mode makes sure, that the gauge will not be automatically traversed and the pneumatic guide rollers will not close unexpectedly.

Caution: Crushing hazard ! Never traverse the gauge as long as somebody is in the danger zone !

Trouble shooting

If the gauge measures wrong

- Wrong point remeasured ?
  Cross profile strip thickness varies in many cases. If the gauge is checked, strip thickness must be measured at the same distance from the edge as the transducers have measured.

⇨ check the strip thickness at correct edge distance

- Transducers dirty ?
  In a very dirty environment, the rams of the transducers sometimes get too sticky, so that they do not shut completely. If the gauge is then set to zero, the indication of a following measurement is too low. After cleaning, any transducer ram should slide easy in its bushing or bearing for a quite long period of time.

⇨ increase cleaning frequency

- Transducers clamped too hard?
  If the clamp screws in the C-frame are tightened too hard, they possibly distort the transducer housing which increases the friction in the ram guiding.

⇨ loosen the clamp screw and re-tighten with moderate force

- Oil in the flexible cable protection hose?
  The oil increases the friction of the ram guide bushing or ball bearing. In that case the transducers cannot continuously keep contact to a vibrating strip. The measurement then indicates "too thick". Much oil in the protection hose does additionally choke the diamond lifting. Drain the oil from through the brass drain screw (10 mm spanner) at the transducers cable entry. Remove the Allen bolt from the white DAV plastic connector peace and blow in compressed air (see extra DAV instruction manual) .

⇨ Clean the transducer and possibly improve compressed air quality.

- Gauge zero not constant?
  If the screws, which connect the measurement tip with the guide ram, are not tight, the measurement ram might move against the guide ram. If, for example, DAV was activated or material was placed between the transducers and then removed, the zero point changes. The indication is incorrect even if the symmetry is correct.

⇨ Fasten the grub screws in the guide ram (see transducer manual)

- Long-term drift of the zero point?
  An integrated heater heats the gauge so that the temperature does not change whether the gauge is measuring or not. The temperature control should be adjusted so that the gauge always keeps the same temperature when it is moved off the strip or when the measurement starts after a long stop. The temperature should not drift for more than 2°C degrees.

- Short-term drift of zero point?
  Can be noticed, if the rolling has been finished and the gauge in its rear position is directly moved set to nominal size zero without pushing A0. If then the indication drifts away to + or -,the cooling of the diamonds does not work correctly. Check, if the small air pipes are not bent. Coming from the ingoing side of the gauge the jet has to meet exactly the tip of the transducer. Re-adjust the cooling at the pressure valve in the pneumatic cabinet.

⇨ connect the air supply correctly or adjust air pressure
(if the display drifts away to minus - increase cooling,
if the display drifts away to plus - reduce it).

- Indication too low?
  If the transducers in the C-frame are clamped not tight enough, they might be shifted in their bore. Gauge zero is then shifted too.

- Indication wrong?
  If the fine thread of the fine adjustment is defective, the nominal size setting is disturbed.

- Indication wrong?
  Check the transducer symmetry by moving up and down both transducer tips. If the indication does not stay 0

⇨ readjust the transducer symmetry

- Additional check for gauges with decade switch (type FS3/FS4): After symmetry adjustment or after a new transducer was installed, the adjustment of the measurement amplifier to the nominal size selector has to be checked by a slip gauge. Set the gauge to 0 and insert 500 or 800 µm slip gauge. Then set the decade switch to 500 (resp. 800) and check, if the gauge measures zero. If not,

⇨ adjust the VMF to the nominal size selector switch by the X9 sensitivity potentiometer

- Indication too high ?
  Put an adjustment plate onto the lower guide rollers and set the gauge to zero. Tip the plate it to both sides as well as forward and backward. The indication should deflect only towards +. If not,

⇨ check the complete gauge (measurement tips for wear, C-frame for 90° position and C-frame distortion)

- Indication too high ?
  After strip breaking or when the strip end passed through the gauge, the C-frame is possibly bent. The indication is too high. Check as before and

⇨ check the alignment of transducer clamping bores with a 20 mm inspection pin

If the gauge marks the strip ?

- Diamond with small cracks ?
  If hit too hard, the diamonds in the transducer measurement tips might get tiny ring-shaped cracks, which are hardly visible. Sometimes such cracks mark the strip

⇨ replace the measurement tip

- Diamond broken out?
  In case of strip breaking a diamonds might break out of a transducer measurement tip.

⇨ replace the measurement tip

- Roller blocked ?

⇨ Replace the roller. If the roller surface is not damaged, replace only the bearings.

Maintenance

The thickness gauge does not need much maintenance. Only the measurement tips with the diamonds and the guide rollers are subject to wear. The gauge should be cleaned regularly in order to avoid dirt deposits which might block movable parts.

At least the following points must be checked regularly, even if measurement results and symmetry are correct

Guide rollers

- Clearance?
  The rollers have to move freely. They should have only little axial clearance. Blocking rolls mark the strip.

⇨ Replace defective rollers

- Deposits on the surface?
  Some strip materials tend to leave deposits on the rollers. They cannot run smooth and might mark the strip.

⇨ replace rollers (rework if possible)

- Roller support defective?
  On strip, the pneumatic guide rollers are pressed down (working pressure 3-5 bar). Check regularly, if the upper guide rollers move up to their mechanical limit stop when the compressed air is switched off.

  Standard guide rollers are pushed down by pressure springs. They should be moveable so that they can be pushed up in their guiding.

  Check the lower guide rollers for parallel adjustment (see under 'Continuous checking / Transducer position to strip'

⇨ clean the ball guides if the rollers get stuck

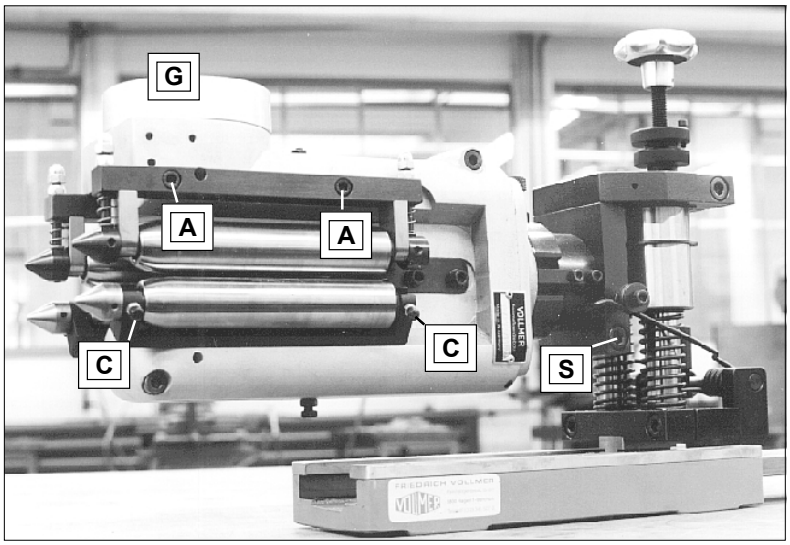
Measurement frame

- Easy movable?
  The C-frame might get stuck because of major dirt deposits in the gauge mechanics, or if after long time of operation the C-frame bearing is worn. This might cause measurement errors. The measurement frame must rest against its bottom limit stop. In that position, the alignment pin must slide easily into the adjustment hole.

⇨ Clean the gauge, send it to Vollmer for repair if the bearing is defective

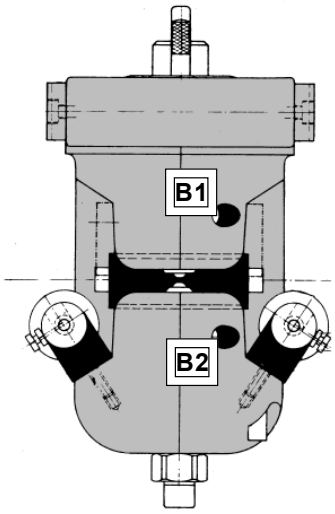
To remove the gauge

First undo all plugs at the connector board behind the gauge and remove the plugs from the board, so that the cables which lead to the gauge head are free. Check the measurement head for temperature, it might be hot !Then



loosen the clamp screw S, get a good hold on the gauge head and pull the gauge off the rotation bearing.

To remove the transducers



At first remove the round cover from the top of the housing (two Allen bolts visible from above). Then loosen the transducer clamp screws (accessible through the two holes B1 and B2 and remove the transducers from the measurement frame

To remove the guide rollers

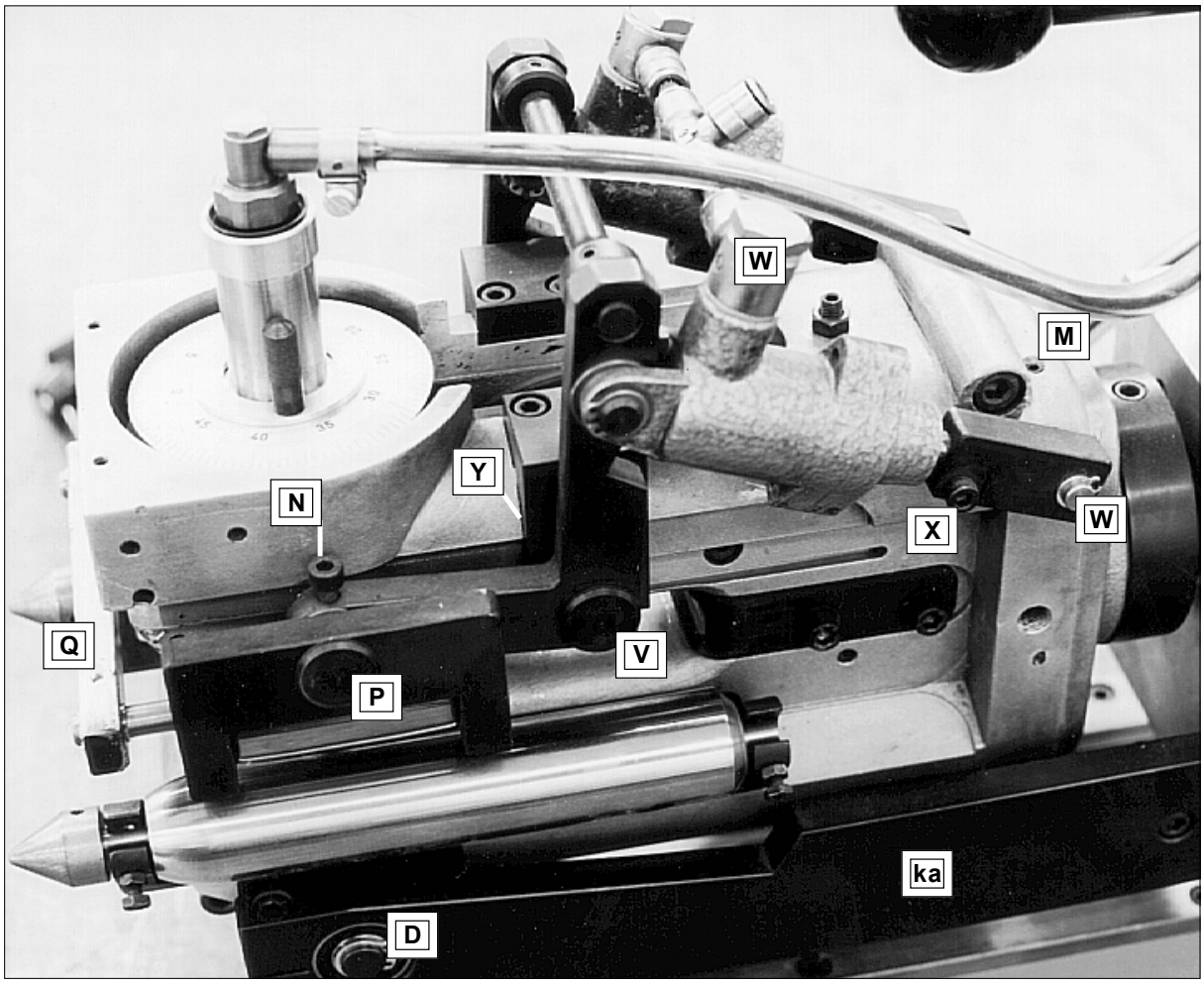
The VBM 1063 is available with spring suspended or with pneumatically operated guide rollers (mod. 'pn', see next page).

Spring suspended rollers(see photo above): Start with the removal of the upper guide roller holdings together with the rollers (two bolts A). Then it is possible to replace all rollers without having to remove the holdings of the lower rollers. Do not install the upper rollers before the transducers are in place.

If possible, do not loosen the screws in the holdings of the lower guide rollers. This would require a complicate alignment procedure by Vollmer. The rollers itself can easily be replaced by loosening the screws C which clamp the roller axle in the holding.

:

pneumatically operated rollers (pn): The upper transducer must be removed to give way for the removal of the upper rollers. Loosen the screws N on both sides of the measurement head and pull off the bolts P. The two rollers with beam Q can now be pulled off towards the front.

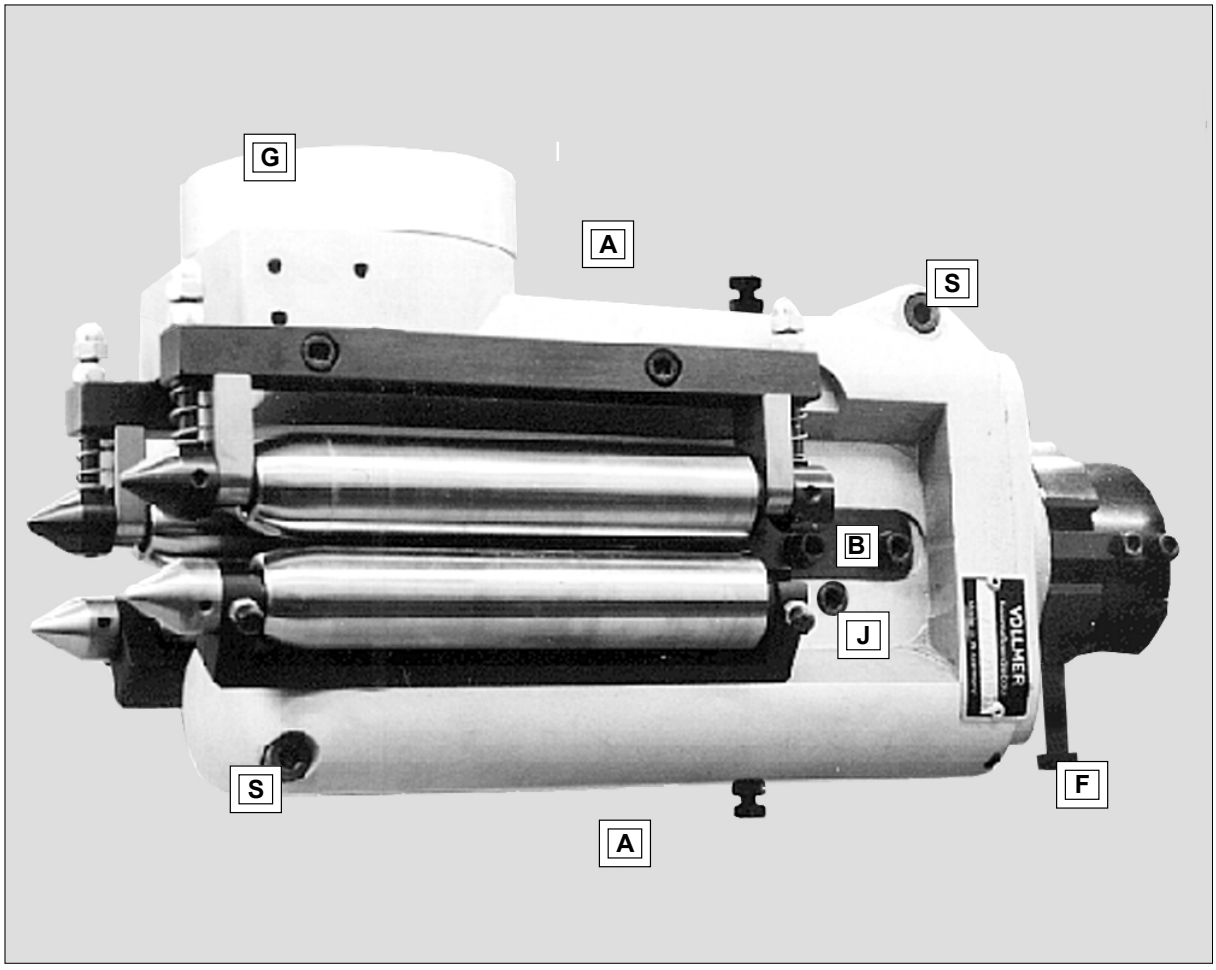


The ka-unit needs only to be removed completely, if one wants to open the gauge housing: After the upper guide rollers were removed, loosen the screw X on each side of the gauge and the grub screws in the two holders Y. Then pull out the bolts V and pull off the upper guide roller holding towards the front (together with the pneumatic cylinders). Now loosen the two grub screws M on axis W, remove the four retaining rings push the axis out of the housing.

To remove the housing from the 'ka' frame

The housing is fastened to the frame 'ka' by four Allen bolts (5 mm hexagon socket wrench). They are accessible from below near rotary bearing D. Loosen the four screws and take the gauge head off the 'ka' frame

To disassemble the housing



① remove the black protection fitting B
② put the housing on its left side, so that the alignment hole J is up
③ Remove adjustment screw F with spring and ram
④ remove the two limit stop screws A
⑤ remove the two bolts S

Important Note !

Do not loosen any other than the items indicated here. If you didn't have a special service training it is most likely that you will cause a considerable loss of measurement accuracy.

⑥ take the right half off the left one (possibly use a plastic hammer). The outer shell of the bearing is fastened at the housing, the inner side lies on the C-frame

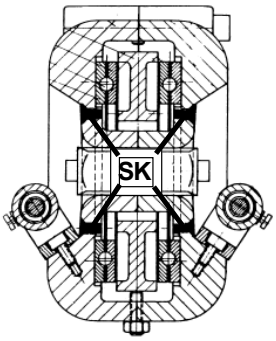
⑦ Take out the balls and take the bearing off the C-frame. Do not swap the bearing shells!

⑧ Take note of the number of washers (spacers) between C-frame and bearing(equal number of washers on each pin)

⑨ Take off the washers and put them aside

⑩ Now remove the C-frame and the inner shell of the second bearing. There are no washers at this side.

Important note



Do not loosen the four hollow screws SK (for 3 mm hexagonal socket wrench). If those screws need to be removed in order to replace the bearings, only one side may be removed at a time. Then the housing should be reassembled, so that the remaining old bearing is positioning the new one. The second bearing (on the other side of the C-frame) must not be removed, before the new one is precisely positioned and secured. If both bearings are loose at the same time, the alignment drill in housing and measurement frame becomes useless.

Clean C-frame, shells and balls with a non-aggressive solvent and dry them completely with compressed air. If there are any traces of wear in the shells, replace both bearings and balls (see "To replace the bearings")..

If there were wrong measurement result, e.g. after a strip breaking, the alignment of the transducer clamps in the C-frame must be checked with an inspection bolt (available at Vollmer). It has easily to slide through both clamps. If not, get the C-frame aligned at Vollmer.

Spare Parts

Each single item is named by its drawing number and the position number on that drawing. For example:

A special guide roller of the VBM 1063 is item 101.6 a on drawing W68/005/13/Ba.

Note

Please order spare parts exclusively based on the technical drawings in the documentation, not on this manual.

To replace the bearings

The ball bearings should be replaced, if there is any sign of wear at the shells. In that case the C-frame cannot move easy enough to follow all strip movements. Do not loosen the four hollow screws SK (for 3 mm hexagonal socket wrench) on both sides at the same time. This would make alignment drill in housing and C-frame useless. Here is a step by step instruction how to replace the bearings:

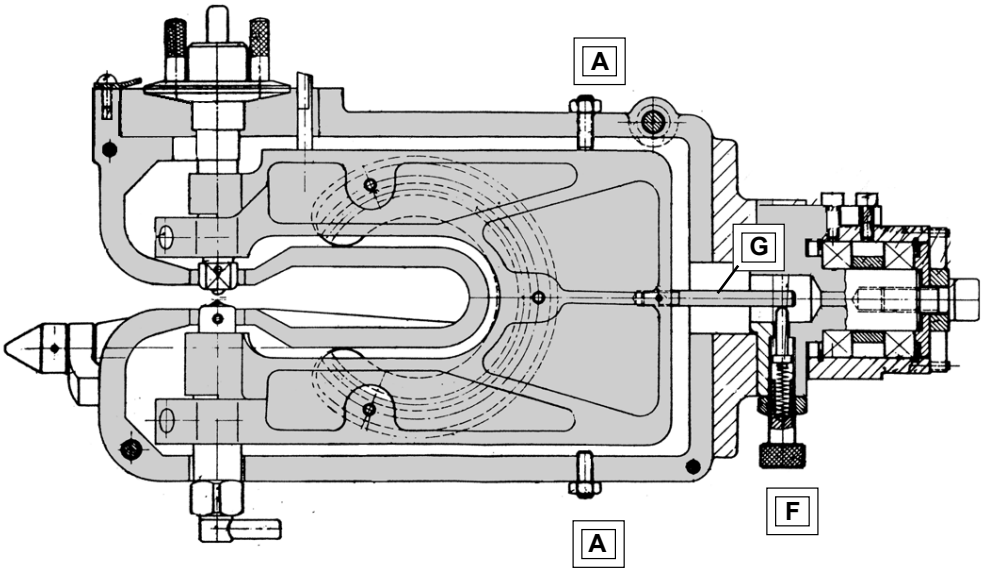
- remove the outer shell of the left bearing and replace it by a new one whichs screws are not tightened.
- put new balls in the new left inner bearing shell (10 balls per section)
- take that inner shell with the balls in one hand and the left half of the housing (with the outer shell of the bearing) in the other hand. Put the housing with the outer shell on top of the inner shell with the bearings, press the parts together and turn them upside down.
- put in the C-frame and then the washers
- put the cleaned old inner shell (of the right side bearing) onto the C-frame and insert the cleaned old balls.
- put on the right half of the housing and press everything together
- insert the two screws S and tighten them while moving the C-frame in its bearings. The C-frame must remain easy movable, but no lateral clearance is allowed. Adjust this by removing or adding one washer on each pin
- push in the alignment pin tighten all four screws SK of the left side shell
- now change the right side bearing in the same way, so that it will be precisely positioned by the new bearing on the left side

To assemble the housing

Before finally closing the housing, lubricate the ball bearings well with resin free oil. After the housing was assembled, check the C-frame again for easy movement. If there is any resistance in the bearing, remove one distance washer from each pin. The C-frame must be easy movable all the way up and down, even if that means to have a little lateral clearance.

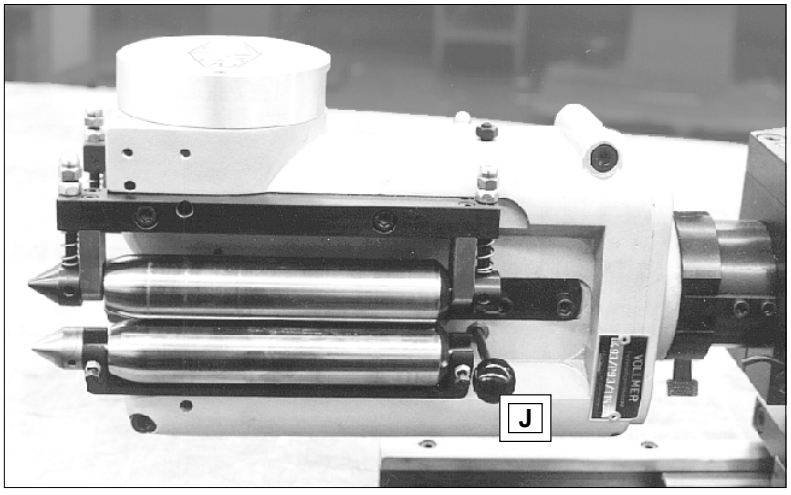
Measurement frame adjustment

First insert the brass screw F with its spring and ram and screw it to its original position, so that the C-frame is spring pushed against the limit stop U. There should be a perceptible spring load when the front end of the C-frame is lifted from the limit stop.



VBM 1063: The measurement frame is held by two ball bearings in the gauge housing.

Then insert the alignment pin J into the gauge housing. This aligns the C-frame in the 90°-position, so that the transducer bores are exactly perpendicular to the lower guide rollers axes.



VBM 1063 with alignment pin J: That pin is used to align the C-frame to the 90°-position when installing transducers or adjusting the limit stop screws.

Now adjust the limit stop screws A:

- in gauges with **sum measurement** (two transducers with movable tips) turn the upper screw A clockwise and lock it in that position where it is just touching the C-frame. When the adjustment pin is now pulled out, the front end of the measurement frame should not move down.

- gauges with **single measurement** (one transducer with movable ram and one rigid measurement tip) need to have the upper pin screw A screwed clockwise until it touches the C-frame. Then screw it back for half a turn (180°) and lock it. When pulling the alignment pin, the front end of the C-frame should drop for about 1 mm.

The bottom limit stop screw is always adjusted in such a position, that the front end of the C-frame can be lifted as far as possible, but the transducer scale ring (if there is any) and the pin G must not touch the housing. Turn the lower A screw back for a several turns and lift the front end of the measurement frame up to its limit stop. Hold it there and turn the lower screw A into the housing until it begins to push down the front end of the measurement frame.

To assemble the guide rollers

First insert the lower guide rollers. Their support has to be aligned parallel, so that the test plate contacts the rollers at four points. For changing the lower guide rollers, there is no need to loosen the support. But it might be shifted after strip breaking. The upper guide rollers are assembled together with their support after the transducers are in correct position.

To check the transducer alignment

If there was any wrong measurement result, e.g. after a strip break, the alignment of the transducer clamps should be checked with an inspection bolt (available from Vollmer). It must slide easily through the two clamps. If not, have the C-frame aligned at Vollmer, or replace it.

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Transducer check

This is just a basic check of the transducer function. Please read the separate transducer service manual for service and repair.

- Ram easy movable ?
  The transducer rams must be easy to be pushed in and spring back immediately.

- Measurement tips worn or damaged?
  If the measurement result of the slip gauge plate is not 0, but the other checks are all right, remove the transducers and check the measurement tips:

- Diamonds worn?
  The diamonds should be crowned to achieve accurate measurement results. Worn diamonds with flat spots may cause measurement errors.

⇨ Replace and possibly get the old diamonds reworked

- Broken diamonds?
  Cause incorrect measurement results and mark the strip

⇨ Replace

- Measurement tips with broken-out diamonds? (after strip breaking or when the strip end has passed through the gauge)

⇨ Replace

- Micrometer thread damaged?
  Worn micrometer threads cause measurement errors. Check: Set the transducer to zero, select a nominal size and insert the correspondent slip gauge. Try with several slip gauges. The indication has to be very close to zero. If not,

⇨ send the transducer to Vollmer for repair without trying to repair the thread by yourself.

Transducer installation

After cleaning or diamond changing the transducers can easily be reinstalled into the C-frame:

- connect the bottom transducer B to cable/socket X2 and put a test plate onto the lower guide rollers
- switch on the VMF measurement amplifier, select the 1000 µm measurement range, set the nominal size to zero
- insert the alignment pin into the lateral hole to align the measurement frame to the 90°-position
- insert the bottom transducer into its holding and push it up against the test plate until the amplifier indicates the required value. That value depends on the type of the gauge (see gauge card in the documentation) and the application:

We marked the paragraph with the optimum values for your application:

Transducers with 1 mm stroke (20-MUBE-0/20 MOBE-0) and measurement amplifier VMF 3/11 or 3/22 or 3/2000: clamp lower transducer at +500 µm

Transducers with 1 mm stroke (two 20-MUBE-0) and measurement amplifier VMF 3/11 or 3/22 or 3/2000: clamp lower transducer at +800 µm. If measuring only strip below 1 mm, clamp the lower transducer at +500 µm

Transducers with 2 mm stroke (series -90 or -92, 20-MUBE/20 MOBE), and measurement amplifier VMF 3/2000: clamp lower transducer at +1000 µm

Transducers with 2 mm stroke (series -90 or -92, two 20-MUBE), and measurement amplifier VMF 3/2000: clamp lower transducer at +1500 µm. If measuring only strip below 1 mm, clamp the lower transducer at +500 µm

for single measurement (one transducer and one fixed feeler) clamp the transducer so that it measures 0 at the adjustment plate.

- Then take off the adjustment plate.

Gauges with sum measurement
- select measurement range 10 µm
- for transducers with micrometer fine adjustment: Before inserting, screw the upper part of the transducer clockwise down to the limit stop, and then turn it back for one full turn.
- connect the second transducer and push it into the upper bore against the lower transducer until the measurement amplifier indicates nearly zero. Minor deviations can be eliminated by the zero point potentiometer (VMF 3/22 + 3/22) or the Master key (VMF 3/2000).

Gauges with single measurement
- Before inserting, screw the upper part of the fine adjustment clockwise down to the limit stop, and then turn it back for one full turn.
- push the fine adjustment into the upper bore against the lower transducer until the measurement amplifier indicates nearly zero. Minor deviations can be eliminated by the zero point potentiometer (VMF 3/22 + 3/22) or the Master key (VMF 3/2000).

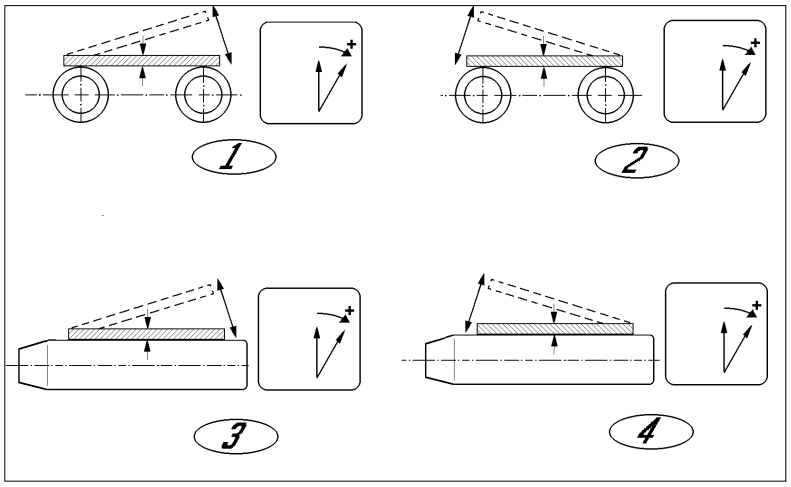
Important note

Please do always use a transducer together with its own extension cable, which was individually adjusted to the transducer measurement characteristics. With another cable the gauge accuracy might be affected.

Please do always check the transducer symmetry after a transducer was re-inserted (see extra manual)

To check the transducer position

The upper guide rollers must be lifted or removed for this check. Put the adjustment plate onto the lower guide rollers and tip it to all four directions, see sketch 1 through 4. The indicator must be deflected at any time exclusively towards the + side. If not, the gauge needs service:



If "minus" is indicated when the plate is tilted towards one side (sketches 1+2), either the transducer tips are worn, the C-frame is distorted or the lower guide rollers are not parallel.

If "minus" is indicated when the plate is tilted towards the front or the back sketches 3 + 4), it is also possible, that the 90°-position of measurement frame was not correctly adjusted.

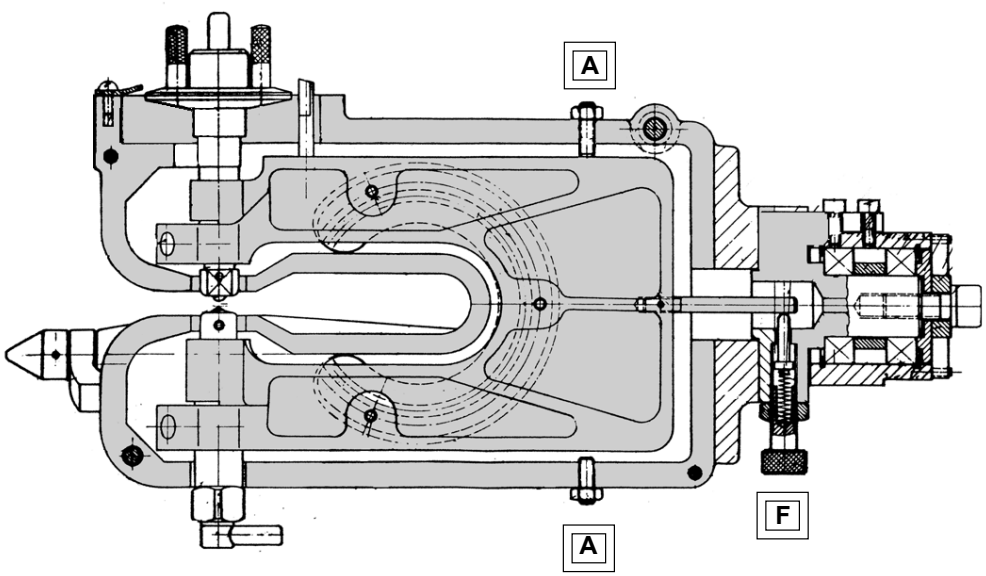
If the indication is deflected to minus, theoretically there might be one transducer with a diamond that is not perfectly centred. This is easy to check by turning the transducer clockwise in 90° steps. Then it is easy to check if the error follows in the same direction when tilting the adjustment plate.

Symmetry check

If there was any soldering done on the cable or the transducer coil, check the compensation resistor in the transducer cable connector as well as the VMF phase and sensitivity adjustment. On gauging systems with transducers of the ../90 series and VMF 3/2000 amplifiers, parts of these procedures are performed automatically (see separate manual).

To adjust the measurement frame

If the gauge is measuring with two transducers in sum, then upper screw A holds the C-frame in the 90°-position. The front end of the frame can only move up (as overload protection). The spring loaded screw F is pushing up the rear end of the measurement frame to pveent it from swinging. Here is no need to change the factory adjustment even when rolling very thin strip.



VBM 1063: The spring loaded screw F is supporting the measurement frame.

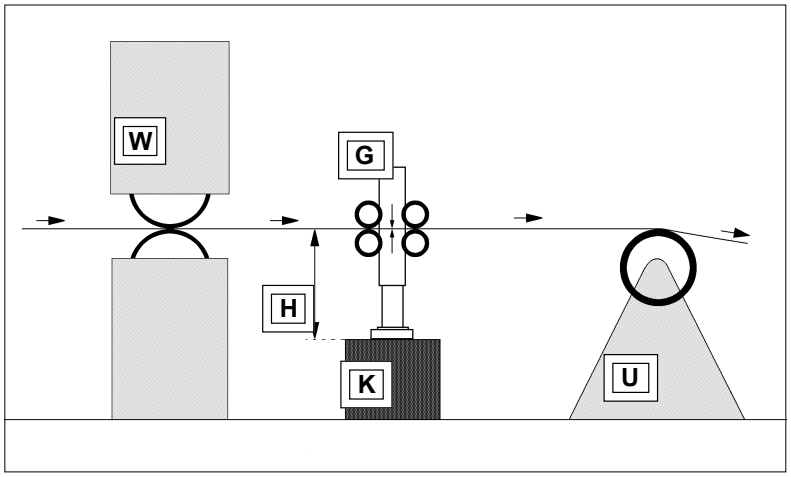
If the gauge has one transducer and one micrometer (single measurement), the strip is lifting the C-frame when the gauge is on the strip. This lifts the bottom transducer against the strip surface. The stronger the C-frame has to be lifted, the safer both sides will keep surface contact. But the pressure must not be too strong in order to avoid traces on the strip. When rolling very soft or thin material, it is possible to give a pressure relief by loosening screw F.

Note: The upper diamond must always carry some weight to avoid wrong measurement. This becomes visible in form of sudden peaks on the recorder.

Installation

When the gauge is installed into an inspection line, installation height and levelling of the gauge are derived from the inspection table. If the gauge was removed from its position, take care to reinstall the slidebase angular to the passline.

In rolling mills the gauge should be installed as described in the following sketch:



If possible, the gauge should be positioned between the roll gap (mill = W) and the deflector roll U. Base and the bracket K are so high that they lie under the strip by the "passline height" H (see data drawing in the documentation). Here the stroke of the vertical guiding is able to follow the expected range of strip movement.

Additional conditions are:

- base parallel to roll axes in the mill
- slidebase rectangular to the strip
- gauge must be able to traverse towards the roll middle

Measurement head adjustment

Passline height

The upper limit stop of the vertical guide should be set to a position where the lower guide rollers touch the strip edge with the upper third of their slope.

Loosen lock nut Y below nut Z, and use nut Z to adjust the gauge head to an appropriate height. Finally tighten lock nut Y.

The large aluminium knob X is used to set the tension of the suspension springs. The suspension should push the gauge head against the upper limit stop of the vertical guide, but not too hard, so that the strip is not lifted by the gauge head. In that case reduce the suspension load. It is set correctly, when the gauge head is slightly lowered by the strip when it is forwarded to the measurement position. When measuring very thin strip, the bottom limit stop might be lowered a little, so that the lower guide rollers put less load to the strip. However, the height must not be reduced too far, so that the lower guide rollers are not permanently driven by the passing strip.

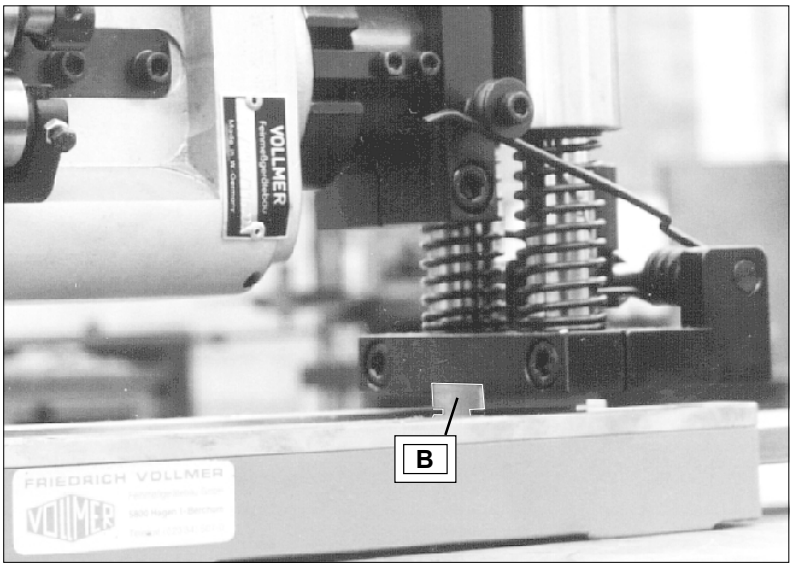
Gauge head passline adjustment: Axial alignment with clamp screw S, height adjustment by means of nut Z, and suspension adjustment by knob X. See the text above and below for details.

Levelling

If the strip does not run horizontally, the gauge head can be turned: Loosen clamp screw S at the rear of the gauge. Lift the gauge at the front, adjust it to the strip passline angle and clamp it again.

Strip breaking

The gauge is mounted onto the slidebase with a shear block. This is to prevent the gauge and its suspension from destruction in case of strip breaking. Shear block B is made from cast iron and easy to replace. In case of overload it shears off, so that the gauge and its suspension can move with the broken strip.



Please check the gauge zero after each strip breaking. If it has not changed, measurement can continue immediately. If the gauge zero has shifted for a minor amount, set the measurement amplifier to zero and check the symmetry. Check a the gauge with a slip gauge, which is integrated into the adjustment plate (addition, available from Vollmer). If these points are all right, measurement can go on.

If the symmetry is disturbed, or if the measurement does not indicate the exact thickness of the sample, check the whole gauge. Take special care of the diamonds, the easy movement of the transducer rams and the alignment of the transducer holes in the C-frame.

Safety precautions

The gauge head might become hot. Check temperature before touching it !